

Docket No.: 5918/FPS/MMCS/APC/DV

7/31  
PATENT/OFFICIAL

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In Application of

SHANMUGASUNDRAM et al.

Serial No. 09/943,955

: Group Art Unit: 2122

Filed: August 31, 2001

: Examiner:

For: FEEDBACK CONTROL OF A CHEMICAL MECHANICAL POLISHING DEVICE  
PROVIDING MANIPULATION OF REMOVAL RATE PROFILES

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**INFORMATION DISCLOSURE STATEMENT**

Honorable Commissioner for Patents  
Washington, D.C. 20231

Sir:

In accordance with the provisions of 37 C.F.R. 1.56, 1.97 and 1.98, the attention of the Patent and Trademark Office is hereby directed to the documents listed on the attached form PTO-1449. It is respectfully requested that the documents be expressly considered during the prosecution of this application, and that the documents be made of record therein and appear among the "References Cited" on any patent to issue therefrom.

This Information Disclosure Statement is being filed within three months of the U.S. filing date OR before the mailing date of a first Office Action on the merits. No certification or fee is required.

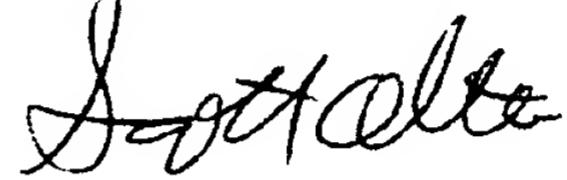
This submission does not constitute a representation that a search has been made or that no better art exists and does not constitute an admission or representation that any of the listed documents is material or constitutes prior art. If it should be determined that any of the listed documents does not constitute prior art under the United States law, Applicants reserve the right

to present to the Office the relevant facts and law regarding the appropriate status of such document.

No certification or fee is believed to be required. However, the Commissioner is hereby authorized to charge any additional fees should any be required for this submission, or credit any overpayment to deposit account no. 08-0219.

Respectfully submitted,

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## U.S. PATENT DOCUMENTS

EXAMINER'S INITIALS	PATENT NO.	DATE	NAME	CLASS	SUBCLASS	FILING DATE
	4,796,194	01/03/89	Atherton			08/20/86
	5,089,970	02/18/92	Lee et al.			10/05/89
	5,108,570	04/28/92	Wang			03/30/90
	5,220,517	06/15/93	Sierk et al.			08/31/90
	5,236,868	08/17/93	Nulman			04/20/90
	5,260,868	11/09/93	Gupta et al.			10/15/91
	5,295,242	03/15/94	Mashruwala et al.			11/02/90
	5,309,221	05/03/94	Fischer et al.			12/31/91
	5,329,463	07/12/94	Sierk et al.			01/13/93
	5,367,624	11/22/94	Cooper			06/11/93
	5,398,336	03/14/95	Tantry et al.			06/16/93
	5,402,367	03/28/95	Sullivan et al.			07/19/93
	5,408,405	04/18/95	Mozumder et al.			09/20/93
	5,410,473	04/25/95	Kaneko et al.			12/16/92

## FOREIGN PATENT DOCUMENTS

EXAMINER'S INITIALS	PATENT NO.	DATE	COUNTRY	CLASS	SUBCLASS	Translation	
						Yes	No
	01-283934	11/15/89	Japan			X	
	2,050,247	08/29/91	Canada			X	

## OTHER ART (Including Author, Title, Date, Pertinent Pages, Etc.)

	Dishon, G., D. Eylon, M. Finarov, and A. Shulman. "Dielectric CMP Advanced Process Control Based on Integrated Monitoring." Ltd. Rehoveth, Israel: Nova Measuring Instruments.
	Runyan, W. R., and K. E. Bean. 1990. "Semiconductor Integrated Circuit Processing Technology." pg. 48. Reading, Massachusetts: Addison-Wesley Publishing Company.

EXAMINER

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	5,490,097	02/06/96	Swenson et al.			08/06/93
	5,495,417	02/27/96	Fuduka et al.			03/16/93
	5,497,316	03/05/96	Sierk et al.			04/04/95
	5,503,707	04/02/96	Maung et al.			09/22/93
	5,508,947	04/16/96	Sierk et al.			05/13/94
	5,629,216	05/13/97	Wijaranakula et al.			02/27/96
	5,657,254	08/12/97	Sierk et al.			04/15/96
	5,661,669	08/26/97	Mozumder et al.			06/07/95
	5,694,325	12/02/97	Fukuda et al.			11/22/95
	5,698,989	12/16/97	Nulman			09/13/96
	5,719,495	02/17/98	Moslehi			06/05/96
	5,740,429	04/14/98	Wang et al.			07/07/95
	5,751,582	05/12/98	Saxena et al.			09/24/96
	5,754,297	05/19/98	Nulman			04/14/97
	5,764,543	06/09/98	Kennedy			06/16/95

## FOREIGN PATENT DOCUMENTS

EXAMINER'S INITIALS	PATENT NO.	DATE	COUNTRY	CLASS	SUBCLASS	Translation	
						Yes	No
	2,165,847	08/29/91	Canada			X	
	2,194,855	08/29/91	Canada			X	

## OTHER ART (Including Author, Title, Date, Pertinent Pages, Etc.)

	Zorich, Robert. 1991. <i>Handbook of Quality Integrated Circuit Manufacturing</i> . pp. 464-498 San Diego, California: Academic Press, Inc.
	Rampalli, Prasad, Arakere Ramesh, and Nimish Shah. 1991. <i>CEPT—A Computer-Aided Manufacturing Application for Managing Equipment Reliability and Availability in the Semiconductor Industry</i> . New York, New York: IEEE.

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	5,808,303	09/15/98	Schlagheck et al.			01/29/97
	5,838,595	11/17/98	Sullivan et al.			11/25/96
	5,883,437	03/16/99	Maruyama et al.			12/28/95
	5,910,011	06/08/99	Cruse			05/12/97
	6,054,379	04/25/00	Yau et al.			02/11/98

## FOREIGN PATENT DOCUMENTS

EXAMINER'S INITIALS	PATENT NO.	DATE	COUNTRY	CLASS	SUBCLASS	Translation	
						Yes	No
	05-151231	06/18/93	Japan				X
	05-216896	08/27/93	Japan				X
	05-266029	10/15/93	Japan				X
	06-110894	04/22/94	Japan				X
	06-176994	06/24/94	Japan				X
	06-252236	09/09/94	Japan				X
	06-260380	09/16/94	Japan				X
	08-149583	06/07/96	Japan				X
	09-34535	02/07/97	Japan				X
	EP 0877308 A2	11/11/98	Europe				X
	11-67853	03/09/99	Japan				X
	1072967A3	11/21/01	Europe				X

## OTHER ART (Including Author, Title, Date, Pertinent Pages, Etc.)

	Moyné, James R., Nauman Chaudhry, and Roland Telfeyan. 1995. "Adaptive Extensions to a Multi-Branch Run-to-Run Controller for Plasma Etching." <i>Journal of Vacuum Science and Technology</i> . Ann Arbor, Michigan: University of Michigan Display Technology Manufacturing Center.
	Moyné, James, Roland Telfeyan, Arnon Hurwitz, and John Taylor. August 1995. "A Process-Independent Run-to-Run Controller and Its Application to Chemical-Mechanical Planarization." <i>SEMI/IEEE Advanced Semiconductor Manufacturing Conference and Workshop</i> . Ann Arbor, Michigan: The University of Michigan, Electrical Engineering & Computer Science Center for Display Technology & Manufacturing.

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EXAMINER'S INITIALS	PATENT APPLICATION NO.	FILING DATE	NAME	TITLE	CLASS	SUB-CLASS
	09/363,966	07/29/99	Arackaparambil et al.	Computer Integrated Manufacturing Techniques		
	09/469,227	12/22/99	Somekh et al.	Multi-Tool Control System, Method and Medium		
	09/619,044	07/19/00	Yuan	System and Method of Exporting or Importing Object Data in a Manufacturing Execution System		
	09/637,620	08/11/00	Chi et al.	Generic Interface Builder		
	09/656,031	09/06/00	Chi et al.	Dispatching Component for Associating Manufacturing Facility Service Requestors with Service Providers		

## FOREIGN PATENT DOCUMENTS

EXAMINER'S INITIALS	PATENT NO.	DATE	COUNTRY	CLASS	SUB-CLASS	Translation
						Yes No

## OTHER ART (Including Author, Title, Date, Pertinent Pages, Etc.)

	Zhou, Zhen-Hong and Rafael Reif. August 1995. "Epi-Film Thickness Measurements Using Emission Fourier Transform Infrared Spectroscopy—Part II: Real-Time <i>in Situ</i> Process Monitoring and Control." IEEE Transactions on Semiconductor Manufacturing, Vol. 8, No. 3.
	Telfeyan, Roland, James Moyne, Nauman Chaudhry, James Pugmire, Scott Shellman, Duane Boning, William Moyne, Arnon Hurwitz, and John Taylor. October 1995. "A Multi-Level Approach to the Control of a Chemical-Mechanical Planarization Process." Minneapolis, Minnesota: 42 <sup>nd</sup> National Symposium of the American Vacuum Society.
	Chang, E., B. Stine, T. Maung, R. Divecha, D. Boning, J. Chung, K. Chang, G. Ray, D. Bradbury, O. S. Nakagawa, S. Oh, and D. Bartelink. December 1995. "Using a Statistical Metrology Framework to Identify Systematic and Random Sources of Die- and Wafer-level ILD Thickness Variation in CMP Processes." Washington, D.C.: International Electron Devices Meeting.

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## U.S. PATENT DOCUMENTS

EXAMINER'S INITIALS	PATENT APPLICATION NO.	FILING DATE	NAME	TITLE	CLASS	SUB-CLASS
	09/655,542	09/06/00	Yuan	System, Method and Medium for Defining Palettes to Transform an Application Program Interface for a Service		
	09/725,908	11/30/00	Chi et al.	Dynamic Subject Information Generation in Message Services of Distributed Object Systems		
	09/800,980	03/08/01	Hawkins et al.	Dynamic and Extensible Task Guide		
	09/811,667	03/20/01	Yuan et al.	Fault Tolerant and Automated Computer Software Workflow		
	09/927,444	08/13/01	Ward et al.	Dynamic Control of Wafer Processing Paths in Semiconductor Manufacturing Processes		
	09/928,473	08/14/01	Koh	Tool Services Layer for Providing Tool Service Functions in Conjunction with Tool Functions		

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## OTHER ART (Including Author, Title, Date, Pertinent Pages, Etc.)

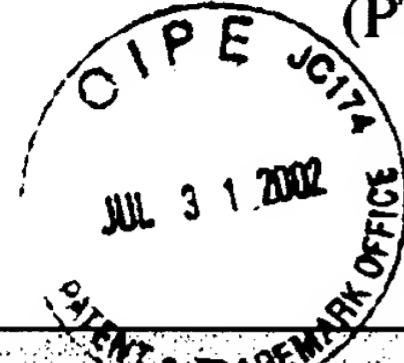
Dishon, G., M. Finarov, R. Kipper, J.W. Curry, T. Schraub, D. Trojan, 4 <sup>th</sup> Stambaugh, Y. Li and J. Ben-Jacob. February 1996. "On-Line Integrated Metrology for CMP Processing." Santa Clara, California: VMIC Speciality Conferences, 1 <sup>st</sup> International CMP Planarization Conference.
Smith, Taber, Duane Boning, James Moyne, Arnon Hurwitz, and John Curry. June 1996. "Compensating for CMP Pad Wear Using Run by Run Feedback Control." Santa Clara, California: VLSI Multilevel Interconnect Conference.
Boning, Duane, William Moyne, Taber Smith, James Moyne, Roland Telfeyan, Arnon Hurwitz, Scott Shellman, and John Taylor. October 1996. "Run by Run Control of Chemical-Mechanical Polishing." IEEE Trans. CPMT (C), Vol. 19, No. 4, pp. 307-314.
SEMI. [1986] 1996. "Standard for Definition and Measurement of Equipment Reliability, Availability, and Maintainability (RAM)." SEMI E10-96.

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	09/928,474	08/14/01	Krishnamurthy et al.	Experiment Management System, Method and Medium		

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						Yes No

**OTHER ART (Including Author, Title, Date, Pertinent Pages, Etc.)**

	Van Zant, Peter. 1997. <i>Microchip Fabrication: A Practical Guide to Semiconductor Processing</i> . Third Edition, pp. 472-478. New York, New York: McGraw-Hill.
	Campbell, W. Jarrett, and Anthony J. Toprac. February 11-12, 1998. "Run-to-Run Control in Microelectronics Manufacturing." Advanced Micro Devices, TWMCC.
	Edgar, Thomas F., Stephanie W. Butler, Jarrett Campbell, Carlos Pfeiffer, Chris Bode, Sung Bo Hwang, and K.S. Balakrishnan. May 1998. "Automatic Control in Microelectronics Manufacturing: Practices, Challenges, and Possibilities." Automatica, Vol. 36, pp. 1567-1603, 2000.
	Moyne, James, and John Curry. June 1998. "A Fully Automated Chemical-Mechanical Planarization Process." Santa Clara, California: VLSI Multilevel Interconnection (V-MIC) Conference.
	SEMI. July 1998. <i>New Standard: Provisional Specification for CIM Framework Domain Architecture</i> . Mountain View, California: SEMI Standards. SEMI Draft Doc. 2817.
	Consilium. August 1998. <i>Quality Management Component: QMC™ and QMC-Link™ Overview</i> . Mountain View, California: Consilium, Inc.
	Chemali, Chadi El, James Moyne, Kareemullah Khan, Rock Nadeau, Paul Smith, John Colt, Jonathan Chapple-Sokol, and Tarun Parikh. November 1998. "Multizone Uniformity Control of a CMP Process Utilizing a Pre and Post-Measurement Strategy." Seattle, Washington: SEMETECH Symposium.
	Consilium. 1998. <i>FAB300™</i> . Mountain View, California: Consilium, Inc.
	Khan, Kareemullah, Victor Solakhain, Anthony Ricci, Tier Gu, and James Moyne. 1998. "Run-to-Run Control of ITO Deposition Process." Ann Arbor, Michigan.

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	Consilium. January 1999. "FAB300™: Consilium's Next Generation MES Solution of Software and Services which Control and Automate Real-Time FAB Operations." <a href="http://www.consilium.com/products/fab300_page.htm#FAB300 Introduction">www.consilium.com/products/fab300_page.htm#FAB300 Introduction</a>
	Consilium. July 1999. "Increasing Overall Equipment Effectiveness (OEE) in Fab Manufacturing by Implementing Consilium's Next-Generation Manufacturing Execution System - MES II." Semiconductor Fabtech Edition 10.
	Consilium Corporate Brochure. October 1999. <a href="http://www.consilium.com">www.consilium.com</a>
	Moyné, James. October 1999. "Advancements in CMP Process Automation and Control." Hawaii: (Invited paper and presentation to) Third International Symposium on Chemical Mechanical Polishing in IC Device Manufacturing: 196 <sup>th</sup> Meeting of the Electrochemical Society.
	Consilium. November 1999. <i>FAB300™ Update</i> .
	SEMI. 2000. "Provisional Specification for CIM Framework Scheduling Component." San Jose, California. SEMI E105-1000.
	Lee, Brian, Duane S. Boning, Winthrop Baylies, Noel Poduje, Pat Hester, Yong Xia, John Valley, Chris Koliopoulos, Dale Hetherington, HongJiang Sun, and Michael Lacy. April 2001. "Wafer Nanotopography Effects on CMP: Experimental Validation of Modeling Methods." San Francisco, California: Materials Research Society Spring Meeting.
	NovaScan 2020. February 2002. "Superior Integrated Process Control for Emerging CMP High-End Applications."
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